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APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: U-Nut Fastening Assembly

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U-NUT FASTENER ASSEMBLY

FIELD OF THE INVENTION

This invention relates to U-Nuts, and particularly to U-Nuts that are used to secure two objects together.

BACKGROUND OF THE INVENTION

U-Nuts are known in the art and are used with fasteners. The present invention is an improved U-Nut.

SUMMARY OF THE INVENTION

The scope of the present invention is defined solely by the appended claims, and is not affected to any degree by the statements within this summary. Briefly stated, a U-Nut, comprising, a substrate including a flex area wherein the substrate and the flex area include a polymer; a first substrate segment, a second substrate segment, and a flex area, wherein the first substrate segment and the second substrate segment are located adjacent to the flex area; a retainer located on the first substrate segment; and an acceptor located on the second substrate segment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 depicts an elevated side perspective view of the U-Nut of the preferred embodiment;

FIGURE 2 depicts a side profile view of the U-Nut of the preferred embodiment;

FIGURE 3 depicts a side profile view of the substrate on the U-Nut of the preferred embodiment;

FIGURE 4 depicts a side profile view of the U-Nut of the preferred embodiment

FIGURE 4A depicts a close up side profile view of the flex area on the U-Nut of the preferred embodiment;

FIGURE 5 depicts the U-Nut of the preferred embodiment relative to a window;

FIGURE 6 depicts a top profile view of the U-Nut of the preferred embodiment;

FIGURE 7 depicts a bottom profile view of the U-Nut of the preferred embodiment; and

FIGURE 8 depicts a side profile view of the U-Nut of the preferred embodiment relative to a window.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

As shown in FIG. 1, the U-Nut 10 provided with a substrate 20. The substrate 20 is provided with a flex area 100 so that the substrate 20 is flexible. Located adjacent to the flex area 100 are first and second substrate segments 21 and 22 respectively. Located on the substrate 20 is a retainer 30. As shown in FIG. 1, the retainer 30 is located on the first substrate segment 21 and is provided with at least one securing member. In the embodiment shown in FIG. 1, the retainer 30 is provided with a first securing member 31 and a second securing member 32.

According to one aspect of the present invention, the first and second securing members 31, 32 are configured to elastically deform. According to another aspect of the present invention, the first and second securing members 31, 32 are shaped to cooperate with an acceptor 70. According to yet another aspect of the present invention, the first and second securing members 31, 32 are configured to cooperate with a fastener 61, such as a bolt or threaded rod, preferably a self-tapping screw.

As shown in FIG. 2, the first and second securing members 31, 32 include stems 33 and 34 respectively. The stems 33, 34 are provided with widths 35, 36. Located on the stems 33, 34 are angled surfaces 37 and 38, respectively. As shown in FIG. 2, angled surfaces 37 and 38 are at angles 39 and 40, respectively, with respect to the axis of the stems 33, 34 depicted as imaginary lines A and B, respectively. Angles 39 and 40 range from 90° to 180°, and both preferably measure 45°.

The first and second securing members 31, 32 are provided with coupling surfaces 14 and 42. The coupling surfaces 41, 42 extend beyond the stems 33, 34 a distance 43. Coupling surfaces 41, 42 are configured to couple to the acceptor 50. The coupling surfaces 41, 42 are also configured to cooperate with the angled surfaces 37, 38 so that the securing members 31, 32 are coupled to the acceptor 70.

The flex area 100 is shaped so that the first and second substrate segments 21 and 22 are flexibly connected at flex area 100. The flex area 100 is configured so that the first and second substrate segments 21, 22 can be brought into closer proximity. As depicted in FIG 3, the substrate 20 is flexed at flex area 100 so that the substrate first and second substrate

segments 21, 22 are brought into contact by moving along predetermined paths depicted as imaginary lines 44, 45 respectively. These imaginary lines 44, 45 are arcs having radii 46, 47 respectively. According to one aspect, the radii 46, 47 are dimensioned according to the substrate 20. According to another aspect, the radii 46, 47 are dimensioned according to there the flex area 100 is located on the substrate 20. According to yet another aspect, the radii 46, 47 are dimensioned according to where the retainer 30 is located on the substrate 20. According to still another aspect, the radii 46, 47 are dimensioned according to where the acceptor 70 is located on the substrate 20.

FIG. 4 depicts the substrate 20 with the flex area 100 in greater detail. As shown therein, the substrate 20 is provided with a first substrate surface 48, a second substrate surface 49, and a thickness 50. According to one aspect, the thickness 50 is dimensioned so that the substrate 20 has a predetermined strength. According to another aspect, the thickness 50 is dimensioned so that the substrate 20 has a predetermined flexibility. As depicted in FIG. 4A, the substrate 20 is provided with a decreased amount of material at the flex area 100. In the preferred embodiment, the thickness 50 of the substrate 20 is decreased at the flex area 100. According to one aspect, the thickness 50 of the substrate 20 is decreased by molding a curved surface 51 into the first substrate surface. According to another aspect, the thickness 50 is decreased by molding a trough 52 into the second substrate surface 49.

The flex area 100 is shaped so that the substrate 20 flexes at a predetermined location. FIG. 4A, depicts the flex area 100 with the curved surface 51 and one trough 52. The curved surface 51 and the trough 52 are configured to cooperate with one another and are dimensioned so that the substrate 20 can be flexed 270°.

The substrate 20 is configured so that the substrate segments 21, 22 enfold a predetermined space 53. As shown in FIG. 3, the substrate 20 includes a spacer 54 that is dimensioned according to the predetermined space 53. In the preferred embodiment, the substrate 20 enfolds a window 60. As shown in FIG. 5, the U-Nut 10 is positioned so that the spacer 54 abuts the window 60. The substrate segments 21, 22 are dimensioned so that the acceptor 70 is push fit into an aperture 62 defined within the window 60.

The presently preferred embodiment is provided with an installation member 86. As depicted in FIG. 8, the installation member 86 is located on the substrate 20, preferably at an end 84. Referring now to FIG. 5, the installation member is shaped to cooperate with a

regulator bracket 85 in an automobile. The installation member 86 is in an "L" shape and configured so that the window is able to be installed and fastened to the regulator bracket with greater ease. As further shown in FIG. 5, the installation member 86 is shaped to rest on an edge 83 of the regulator bracket 85.

The acceptor 70, shown in FIG. 6, is configured to be push-fit. Accordingly, the acceptor 70 is shown being push fit through an aperture. In the preferred embodiment, the acceptor 70 is a plurality of acceptor segments 71, 72, 73, 74. The acceptor 70 is segmented so that a predetermined resilience is achieved. According to one aspect of the present invention, the number of acceptor segments is increased so that greater resilience is achieved. According to another aspect, the number of acceptor segments is decreased so that the acceptor 70 is less resilient. In one embodiment, the acceptor 70 is solid and provides minimal resilience. The amount of resilience of the acceptor 70 and the dimensions of the acceptor 70 are determined according to the size of the aperture 62.

The acceptor 70 is configured to accept the retainer 30. In operation, the substrate segments 21, 22 are brought into closer proximity so that the angled surfaces 37 and 38 located on the securing members 31, 32 of the retainer 30 contact cooperating surfaces 75, 76 (shown in FIG. 6) located on the acceptor 70. In the preferred embodiment, the second substrate segment 22 defines an opening 77 shaped to accommodate the securing members 31, 32. As shown in FIG. 6, the cooperating surfaces 75 and 76 are shown as two surfaces; however, in an alternative embodiment, the cooperating surfaces 75 and 76 are merged into a single cooperating surface. The cooperating surfaces 75, 76 are configured to cooperate with the angled surfaces 37, 38 located on the securing members 31, 32. Advantageously, as shown in FIG. 4, the cooperating surfaces 75, 76 are at an angle 87 relative to an axis of the stems 33, 34 depicted as an imaginary line C. The angle 87 ranges from 90° to about 180°.

After the angled surfaces 37, 38 contact the cooperating surfaces 75, 76 and as the substrate segments 21, 22 continue to move along the respective predetermined paths 44, 45, the cooperating surfaces 75 and 76 force the securing members 31, 32 a distance 78 together. According to one aspect, that distance 78 is determined according to the angles 39, 40. According to another aspect, the distance 78 is determined according to the widths 35, 36 of the stems 33, 34. According to yet another aspect, the distance 78 is determined according to the distance 43 the coupling surfaces 41, 42 extend beyond the stems 33, 34.

After the securing members 31, 32 are forced a distance 78 together and as the substrate segments 21, 22 continue to move along the respective predetermined paths 44, 45 so that the angled surfaces 31, 32 move beyond the cooperating surfaces 75, 76 the securing members 31, 32 snap back into place in the direction of arrows 79, 80, shown in FIG. 2. After the securing members 31, 32 snap back into place, the coupling surfaces 41, 42 engage securing surfaces 81, 82 (shown in FIG. 7) located on the acceptor 70.

As shown in FIG. 7, the substrate 20 is provided with a fastening member 90, configured to cooperate with a fastener 61, preferably a self-tapping screw. The fastening member 90 defines an aperture 98 that is dimensioned according to the fastener 61. After the acceptor 70 has been inserted into the aperture 62 of the window 60 and the coupling surfaces 41, 42 engage the securing surfaces 81, 82 the fastener 61 is inserted into the acceptor 70 and the fastening member 90.

The fastener 61, in the preferred embodiment as a self-tapping screw, causes threads to be tapped in the fastening member 90 and the acceptor 70 when the screw is inserted into the U-Nut 10. The acceptor 70 that has been push fit into the aperture 62 of the window 60 expands within the aperture 62 so that a more secure fastening is achieved.

The fastening member 90 is configured to cooperate with the fastener 61. When the fastener 61 is inserted into the fastening member 90, a clamping force, depicted as arrow 89 in FIG. 8, is exerted. As depicted in FIG. 7, the fastening member 90 is provided with a plurality of ribs 91, 92, 93, 94, 95, and 96. The ribs 91, 92, 93, 94, 95, 96 are equally spaced apart and are at an angle 97 relative to the plane of the substrate 11, as depicted in FIG. 4. The angle 97 is determined according to the clamping force 89 exerted by the fastener 61. The clamping force 89 exerted by the fastener 61 is distributed to the substrate 20 through the ribs 91, 92, 93, 94, 95, 96. The area of the substrate 20 over which the clamping force 89 is distributed is determined by the angle 97. As depicted in FIG. 8, the clamping force 89 distributed to the substrate 20 is exerted on the object being fastened, in this case, the window 60. In the preferred embodiment, the angle 97 is 60°; however, in alternative embodiments, the angle 97 measures above 0° to about 90°.

The U-Nut 10 is molded of a polymer, advantageously a nylon, such as nylon 66. The preferred embodiment is molded from Vydyne 22H produced by the Dow Chemical Company. However, in alternative embodiments, the U-Nut 10 is molded of a polymer having a low creep and high tensile strength.

While a preferred embodiment of the invention has been described, it should be understood that the invention is not so limited, and modifications may be made without departing from the invention. The scope of the invention is defined by the appended claims, and all devices that come within the meaning of the claims, either literally or by equivalence, are intended to be embraced therein.